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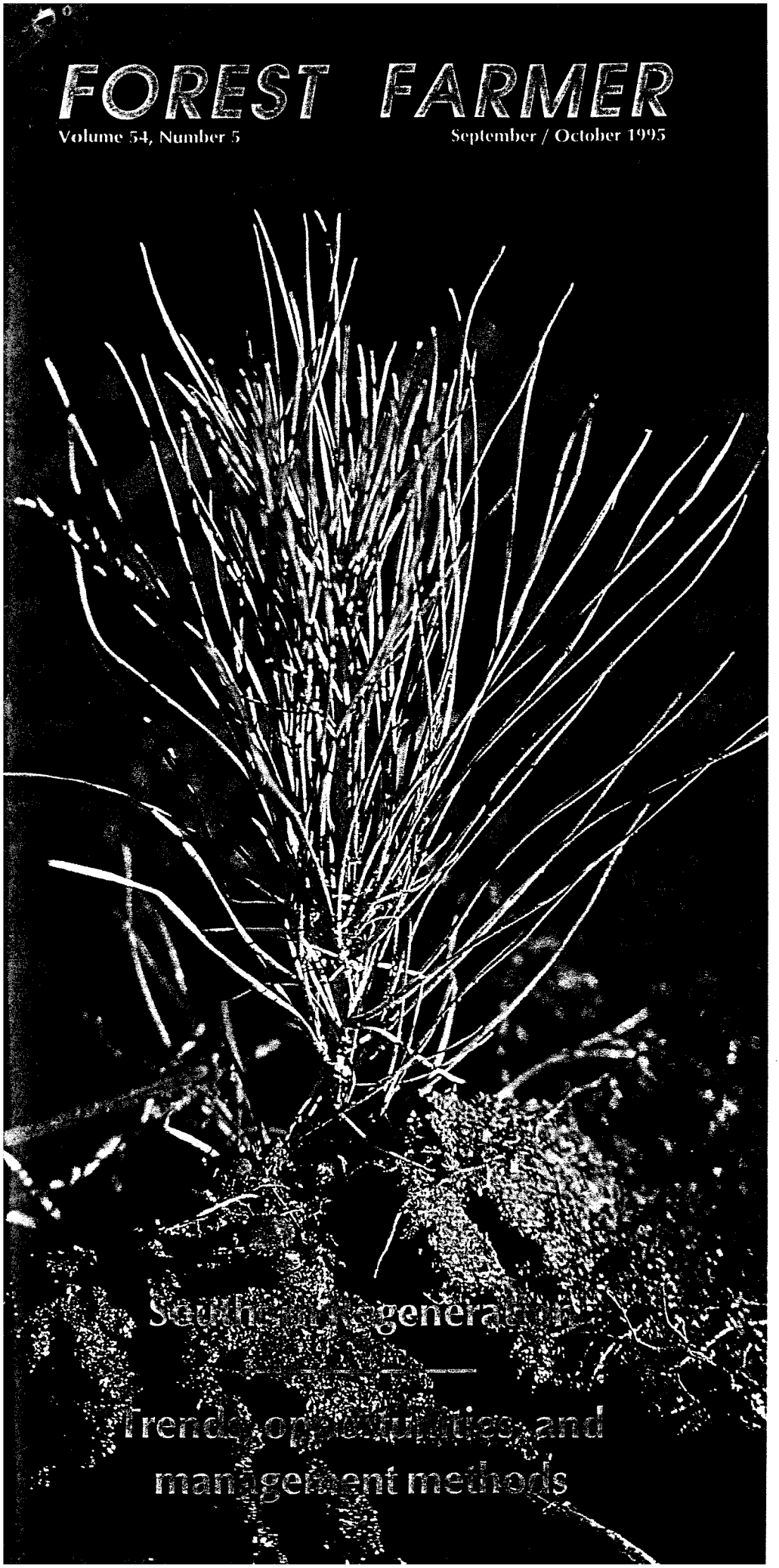
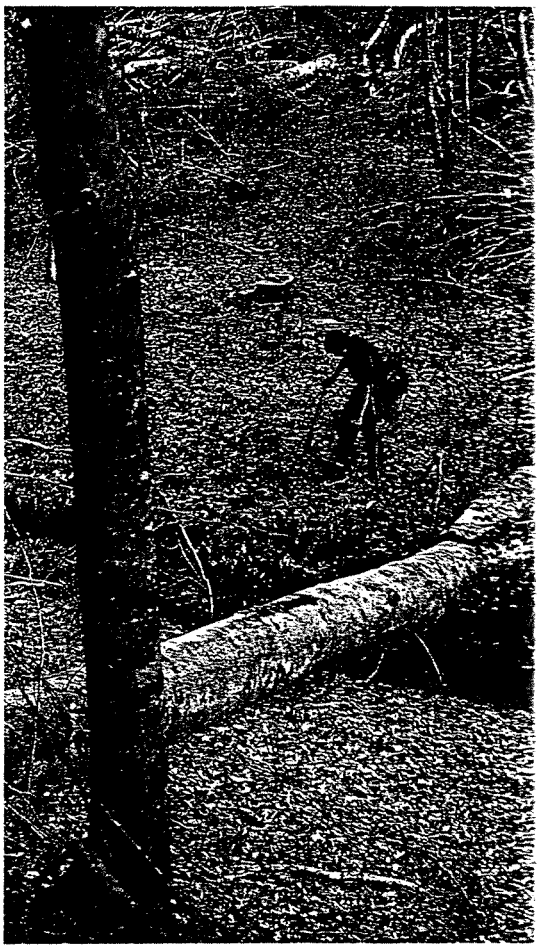


Southern regeneration

Trends, opportunities, and management methods



The Magazine of Forestry in Practice

FOREST FARMER

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Created in 1941, the Forest Farmers Association is a proactive, progressive and hard-hitting grassroots organization of timberland owners - large and small - who own and operate over 45 million acres of timberland in 17 Southern states. With active members in every timbered county in the South, it is the only organization created for the specific purpose of speaking for Southern timberland owners at local, regional and national levels.

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FEATURES

DEPARTMENTS

Back Burning: Alternative to Traditional Precommercial Thinning

If we have to use precommercial thinning, why not lower the cost?

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and
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Where its seeds fall on bare ground in full sunlight, loblolly pine usually has no trouble reestablishing itself after a harvest. Unfortunately, from an economic viewpoint, this natural regeneration process is often too successful, resulting in overstocking. Species such as pines that regenerate primarily from seed (as opposed to sprouts or advanced seedling reproduction) can produce too many seedlings. Years with bumper seed crops, can yield as many as 50,000 pine seedlings per acre, where only 1,000 to 2,000 are desirable.

If timber profits are important land management objectives, then dense pine stands should be thinned when they are young. Thinning concentrates growth on the trees left behind and reduces the time they take to grow to a merchantable size. Unfortunately, this kind of thinning, called precommercial thinning, produces no income because it must be done before any of the trees are large enough to be merchantable. To maximize profits, landowners can either take preventive actions to avoid overcrowding or lower thinning costs for stands that are already too dense.

A forester works in a crowded loblolly stand that is ready for a precommercial back-burn thinning.

Preventing Over-Crowding

The three factors that influence the number of pine seedlings a site will produce are the quality of the site, the size of the seed crop each year and the season the previous stand was harvested. The influence of site quality is simple. Loblolly pine seedlings are better able to compete with hardwoods on dry infertile sites than they are on moist fertile sites. If we were to move from a poor site to sites of increasingly better quality, we would observe fewer pines in the regeneration mix and more hardwoods as the hardwoods out-compete the pines. However, it is difficult to recognize the site-quality threshold beyond which pine seedling stocking reaches acceptable levels. Observant land managers can develop a "feel" for this threshold based on experience in their geographic area. Also, the Department of Forest Resources at Clemson University has research results that show how to use information on soil, land shape and topographic position to identify the threshold where pines will begin to lose the competitive battle with hardwoods.

The second factor that influences pine seedling density is the size of the pine seed crop. While a few formulas are available to predict crop size, experienced land managers familiar with the region can develop a fairly accurate preharvest estimate by estimating the number of pine trees and the number of mature cones in the stand. Identifying the extremes of either pine seed crop failure or a bumper crop will help determine the best year to harvest. Scheduling harvests based on the expected seed crop and site quality can reduce the risk of having too few or too many pine seedlings.

Studies at the USDA Forestry Sciences Laboratory in Athens, Georgia, show the importance of the third factor, the season of harvesting. On poor- and medium-quality Piedmont sites, winter harvesting produced more pine seedlings than summer harvesting for two reasons: first, the mature trees had just dropped their seeds; and second, logging skidders helped scarify the site (expose the soil), thus improving seed germination. When harvesting took place in summer after seeds had germinated, skidders destroyed many new seedlings, helping to reduce seedling density. The Ath-

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ens study also showed that when some unmerchantable residual trees are left standing, their shade causes fewer pine seedlings to develop.

Precommercial Thinning When Pines Are Too Dense

Numerous studies have shown that precommercial thinning of natural loblolly pine stands is a sound investment. Two methods of precommercial thinning are common. The first, called mechanical thinning, uses heavy equipment to mow wide strips, leaving narrow strips of pine or pine and hardwood saplings. The second method, called hand thinning, entails the use of string-trimmer-type saws to cut all trees except those preselected for size and spacing. Hand thinning gets the best results because it leaves an optimum number of desirable tree species; these trees are evenly spaced for better growth.

Backing fires are slower and more expensive than other firing methods. However, they are effective and their cost is a fraction (5 to 15 percent) of the cost of mechanical thinning or hand thinning.

Although economic analyses show good returns from both of these thinning methods, the costs are relatively high. Many landowners cannot afford this investment. Others are reluctant because there are risks that can negate or postpone the return on their investment. Perhaps landowners might be more willing to take the risk if the cost of precommercial thinning was lower.

Two studies (one each at USDA Forestry Sciences Laboratories in Macon, Georgia, and Charleston, South Carolina) suggest that the cost of precommercial thinning can be reduced with low-intensity prescribed burning. Because of the natural characteristic of southern pines to develop a range of sizes (ground-line diameter and height) early in stand life (by age three to six), careful use of backing fires can successfully thin dense stands. Burning kills many small trees but spares larger trees. The largest trees are often undamaged. They will later become the crop trees. Results of these two studies show that backing fires kill very few pine saplings with ground line stem diameters over 1.5 inches. Below this threshold size, the smaller a sapling, the greater its probability of being killed. Backing fires are slower and more expensive than other firing methods. However, they are effective and their cost is a fraction (5 to 15 percent) of the cost of mechanical thinning or hand thinning.

The timing of burning is critical, but depends more on tree size than tree age or the season. The ideal time for burning is when enough trees reach 1.5 inches in diameter at the ground line to leave a fully-stocked stand. Early tests of burning in stands with trees larger than 1.5 inches at the ground line were unsuccessful because low-intensity fires did not kill enough trees. In the Charleston study, the stands were four years old. However, the best age for burning can be as young as three years or as old as eight years as long as sufficient numbers of trees are 1.5 inches in ground line diameter. As might be expected, fires this close to the crowns of young trees will scorch the needles. It looks bad, but scorching usually does not kill pines. The main determinant of survival is ground line stem diameter.

Continued on page 18

Continued from Back Burning *page 17*

Although these results are promising, widespread application awaits further testing under a range of conditions. Land managers who have training and experience with prescribed fire can play an important role in testing this method by applying it in limited areas.

Economic Analyses

The Charleston study applied five precommercial thinning treatments including burning and hand thinning to very dense stands (8,000 to 12,000 pines saplings per acre) at age four. Tree growth was measured until age eight when most of the trees were uprooted by Hurricane Hugo. Economic analyses were conducted by projecting the eight-year-old stands forward to age 30. Growth projections and economic comparisons were done with GATWIGS, a computer growth simulation model developed at Auburn University. GATWIGS is based on data collected by the USDA Forest Service Forest Inventory and Analysis unit in Asheville, North Carolina. The results from the burning and hand thinning treatments follow.

Cost estimates (published in *Forest Farmer Manual*) were $1.97 per acre for prescribed burning and $54.00 per acre for hand thinning. Average returns were $148.00 per 1,000 board feet (Scribner) for pine sawtimber and $14.90 per cord for pine pulpwood. Comparisons were made on the basis of internal rates of return (IRR) and net present value (NPV). IRR is similar to the interest rate (compounded annually) that can be earned from each dollar invested. NPV is the total value of each stand in the future, but expressed in today's dollars. NPV was calculated by applying 4- and 8-percent discounts to the total value of the stands at age 30 back to age four, to coincide with the treatments. The purpose of these economic comparisons was to compare the two thinning treatments, not to predict actual income. It would be a mistake to compare these values with those of other forestry operations or other types of investments.

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Precommercial thinning by burning and by hand thinning produced different types of stands. Burning reduced stand density to 2,850 stems per acre while hand thinning left only 675 stems per acre. Burned stands were considered to be somewhat overstocked, but not enough to need additional thinning. Growth projections to age 30 showed that burned stands would yield 7.8 mbf (Scribner) of pine sawtimber per acre and 19.7 cords of pine pulpwood and that hand-thinned stands would yield 8.7 mbf of pine sawtimber per acre and 25.3 cords of pine pulpwood.

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The economic analyses showed that both burning and hand thinning were good investments. Burning gave the highest IRR (20.3 percent versus 13.0 percent for hand thinning), suggesting a greater return on each invested dollar. Both methods gave positive net present values indicating that they are better choices than not thinning at all. The thinning method with the greatest NPV (indicating the most profit) depended on the discount rate used. At a discount rate of 4 percent, the NPV for stands thinned by hand was $512.91 per acre, as compared to $487.71 for stands thinned by burning. At the higher discount rate of 8 percent, hand thinning increased stand value (NPV = $148.87 per acre) but not as much as burning (NPV = $171.97 per acre). The low cost of burning, combined with the higher discount rate, made additional investment in hand thinning unnecessary.

Summary

Precommercial thinning of young dense loblolly pine stands can be a good investment. Hand thinning is expensive but it ensures that the best trees and the optimum numbers of trees are left standing. Prescribed burning looks promising and is much less expensive than hand thinning. However, burning allows very little control of tree spacing, and its application is somewhat risky. It remains for land managers knowledgeable in the methods of prescribed burning to refine this promising field application.

Continued from Opportunities *page 7*

cies, universities, environmental groups and industry have assembled to do just that. The Committee for Reforestation to Achieve Sustainable Development in the Lower Mississippi River Alluvial Plain is planning a comparison of the economic and environmental benefits of alternate land uses such as row crops, pasture and forests.

The economic analysis for agriculture will include different crop yields under different flooding situations and subsidy levels. Economic analysis for reforestation will include traditional benefits such as timber and hunting leases, but will also evaluate the ability of reforested areas to store carbon. The United States signed an international treaty in 1992 requiring the nation to limit carbon dioxide emissions to 1990 levels by the year 2000. This goal will be difficult to achieve and will require innovative measures. One approach is to provide economic incentives for activities that remove carbon dioxide from the atmosphere. Reforestation does just that, removes carbon dioxide from the air and stores it in wood. Paying landowners to grow forests for carbon storage may seem far-fetched today, but policy makers are seriously considering it. However, the amount of economic return a landowner might realize from this initiative is uncertain at present.

Perhaps the biggest factor preventing wetland reforestation is the long interval between the investment incurred during planting and the return from timber harvest - typically more than 30 years for bottomland hardwood species. A research and demonstration project underway in Sharkey County, Mississippi addresses this problem. Researchers and managers from forest industry, government agencies, and academia are comparing different reforestation methods, including direct seeding acorns, planting oak seedlings, and a nurse crop of cottonwood and oak. The nurse crop is not a new silvicultural technique, just one that has seldom been used in the United States.

The nurse crop idea came from Crown Vantage, who have used it in their landowner assistance program for cases where the landowner wanted to create an oak forest on marginal farmland but needed an economic return sooner than the oaks could provide. In the Sharkey County nurse crop demonstration, cottonwood was planted at a 12- by 12-foot spacing and both herbicide and mechanical cultivation are being used to control weeds. After two growing seasons Nuttall oak will be planted at 12-foot intervals between alternating cottonwood rows. Research from the Forest Service's Southern Hardwood Laboratory has shown that cottonwood can yield over 20 cords of wood by age 10. In the nurse crop technique, cottonwood can either be thinned at age 10 and the remainder left for sawlogs or can be completely harvested to release the oaks. The nurse crop technique is good economically because it provides early income while maintaining the long-term objective of establishing an oak forest. It is also good ecologically because it rapidly provides the vertical structure needed by many forest-dwelling animals, especially birds.

Today, farmers and foresters are not sitting around wringing their hands and bemoaning the loss of wetlands. Instead, they are out with their tractors and dibble bars planting trees. Reforestation can restore many ecological functions that make wetlands special, while producing forest products that are vital to our economy.